

WHAT IS CLAIMED IS

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1. An image reading device comprising:
  - a photoelectric device provided with an empty transfer part;
  - an A-D converter performing A-D conversion on
- 10 an output signal for each pixel of said photoelectric device;
  - a reference voltage varying part varying a reference voltage of said A-D converter;
  - a detecting part detecting a black correction
- 15 reference data from output for each pixel of said photoelectric device;
  - a black shading correcting part subtracting the black correction reference data from digital image data obtained from the output signal for each pixel of
- 20 said photoelectric device when an image is read, through said A-D converter having the reference voltage set therein; and
  - a correcting part correcting the black correction reference data by a ratio between an output
- 25 level of said empty transfer part obtained through said

A-D converter when the black correction reference data is detected and an output level of said empty transfer part obtained through said A-D converter when the image is read.

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2. An image reading device comprising:
- 10           a photoelectric device;
- an empty transfer part output generating part falsely generating an output of empty transfer part of said photoelectric device by outputting a predetermined voltage in predetermined timing;
- 15           an A-D converter performing A-D conversion on an output signal for each pixel of said photoelectric device;
- a reference voltage varying part varying a reference voltage of said A-D converter;
- 20           a detecting part detecting a black correction reference data from output for each pixel of said photoelectric device;
- a black shading correcting part subtracting the black correction reference data from digital image data obtained from the output signal for each pixel of

said photoelectric device when an image is read, through said A-D converter having the reference voltage set therein; and

a correcting part correcting the black  
5 correction reference data by a ratio of an output level  
of said empty transfer part output generating part  
obtained through said A-D converter when the black  
correction reference data is detected and an output  
level of said empty transfer part output generating part  
10 obtained through said A-D converter when the image is  
read.

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3. The image reading device as claimed in  
claim 1, wherein said photoelectric device comprises a  
unity magnification contact-type sensor which receives  
reflected light from an original through a unity  
20 magnification optical system.

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4. The image reading device as claimed in

claim 2, wherein said photoelectric device comprises a unity magnification contact-type sensor which receives reflected light from an original through a unity magnification optical system.

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5. The image reading device as claimed in  
10 claim 1, wherein said correcting part comprises:  
a first adding circuit calculating a sum of  
output levels of said empty transfer part for  
predetermined pixels obtained when the black correction  
reference data is detected;  
15 a second adding circuit calculating a sum of  
output levels of said empty transfer part for the  
predetermined pixels obtained when the image is read;  
a multiplying circuit multiplying the sum  
output from said second adding circuit with the black  
20 correction reference data;  
a dividing circuit dividing the result of  
multiplication output from said multiplying circuit by  
the sum output from said first adding circuit, and  
outputting the result of the division as the black  
25 correction reference data after the correction.
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6. The image reading device as claimed in  
claim 2, wherein said correcting part comprises:

a first adding circuit calculating a sum of  
false output levels of empty transfer part from said  
5 empty transfer part output generating part for  
predetermined pixels obtained when the black correction  
reference data is detected;

a second adding circuit calculating a sum of  
false output levels of empty transfer part from said  
10 empty transfer part output generating part for the  
predetermined pixels obtained when the image is read;

a multiplying circuit multiplying the sum  
output from said second adding circuit with the black  
correction reference data;

15 a dividing circuit dividing the result of  
multiplication output from said multiplying circuit by  
the sum output from said first adding circuit, and  
outputting the result of the division as the black  
correction reference data after the correction.

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7. The image reading device as claimed in  
25 claim 1, wherein said correcting part comprises:

a first adding circuit calculating a sum of output levels of said empty transfer part for predetermined pixels obtained when the black correction reference data is detected;

5               a second adding circuit calculating a sum of output levels of said empty transfer part for the predetermined pixels obtained when the image is read;

10              a microcomputer multiplying the sum output from said second adding circuit with the black correction reference data; and  
                  dividing the result of the multiplication by the sum output from said first adding circuit, and outputting the result of the division as the black correction reference data after the correction.

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8. The image reading device as claimed in  
20 claim 2, wherein said correcting part comprises:

                  a first adding circuit calculating a sum of false output levels of empty transfer part from said empty transfer part output generating part for predetermined pixels obtained when the black correction  
25 reference data is detected;

a second adding circuit calculating a sum of  
false output levels of empty transfer part from said  
empty transfer part output generating part for the  
predetermined pixels obtained when the image is read;

5           a microcomputer multiplying the sum output  
from said second adding circuit with the black  
correction reference data; and

10          dividing the result of the multiplication by  
the sum output from said first adding circuit, and  
10        outputting the result of the division as the black  
correction reference data after the correction.

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9. An image forming apparatus comprising:  
the image reading device claimed in claim 1;

and

20        an image forming device forming an image on a  
sheet based on the image data read by said image reading  
device.

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10. An image forming apparatus comprising:  
the image reading device claimed in claim 2;  
and

an image forming device forming an image on a  
5 sheet based on the image data read by said image reading  
device.

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11. An image reading device comprising:  
photoelectric means provided with empty  
transfer part;  
A-D converting means for performing A-D  
15 conversion on an output signal for each pixel of said  
photoelectric means;  
reference voltage varying means for varying a  
reference voltage of said A-D converting means;  
detecting means for detecting a black  
20 correction reference data from output for each pixel of  
said photoelectric means;  
black shading correcting means for subtracting  
the black correction reference data from digital image  
data obtained from the output signal for each pixel of  
25 said photoelectric means when an image is read, through

said A-D converting means having the reference voltage set therein; and

correcting means for correcting the black correction reference data by a ratio of an output level 5 of said empty transfer part obtained through said A-D converting means when the black correction reference data is detected and an output level of said empty transfer part obtained through said A-D converting means when the image is read.

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12. An image reading device comprising:

15 photoelectric means;

empty transfer part output generating mean for falsely generating an output of empty transfer part of said photoelectric means by outputting a predetermined voltage in predetermined timing;

20 A-D converting means for performing A-D

conversion on an output signal for each pixel of said photoelectric means;

reference voltage varying means for varying a reference voltage of said A-D converting means;

25 detecting means for detecting a black

correction reference data from output for each pixel of  
said photoelectric means;

black shading correcting means for subtracting  
the black correction reference data from digital image  
5 data obtained from the output signal for each pixel of  
said photoelectric means when an image is read, through  
said A-D converting means having the reference voltage  
set therein; and

correcting means correcting the black  
10 correction reference data by a ratio of an output level  
of said empty transfer part output generating means  
obtained through said A-D converting means when the  
black correction reference data is detected and an  
output level of said empty transfer part output  
15 generating means obtained through said A-D converting  
means when the image is read.

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13. The image reading device as claimed in  
claim 11, wherein said photoelectric means comprises a  
unity magnification contact-type sensor which receives  
reflected light from an original through a unity  
25 magnification optical system.

14. The image reading device as claimed in  
claim 12, wherein said photoelectric means comprises a  
unity magnification contact-type sensor which receives  
reflected light from an original through a unity  
5 magnification optical system.

10           15. The image reading device as claimed in  
claim 11, wherein said correcting means comprises:  
               first adding means for calculating a sum of  
               output levels of said empty transfer part for  
               predetermined pixels obtained when the black correction  
15 reference data is detected;  
               second adding means for calculating a sum of  
               output levels of said empty transfer part for the  
               predetermined pixels obtained when the image is read;  
               multiplying means for multiplying the sum  
20 output from said second adding means with the black  
               correction reference data;  
               dividing means for dividing the result of  
               multiplication output from said multiplying means by the  
               sum output from said first adding means, and outputting  
25 the result of the division as the black correction

reference data after the correction.

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16. The image reading device as claimed in  
claim 12, wherein said correcting means comprises:

first adding means for calculating a sum of  
false output levels of empty transfer part from said  
empty transfer part output generating means for  
predetermined pixels obtained when the black correction  
reference data is detected;

10 second adding means for calculating a sum of  
false output levels of empty transfer part from said  
empty transfer part output generating means for the  
predetermined pixels obtained when the image is read;

15 multiplying means for multiplying the sum  
output from said second adding means with the black  
correction reference data;

20 dividing means for dividing the result of  
multiplication output from said multiplying means by the  
sum output from said first adding means, and outputting  
the result of the division as the black correction  
reference data after the correction.

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17. The image reading device as claimed in  
claim 11, wherein said correcting means comprises:

first adding means for calculating a sum of  
output levels of said empty transfer part for  
5 predetermined pixels obtained when the black correction  
reference data is detected;

second adding means for calculating a sum of  
output levels of said empty transfer part for the  
predetermined pixels obtained when the image is read;

10 a microcomputer multiplying the sum output  
from said second adding means with the black correction  
reference data; and

dividing the result of the multiplication by  
the sum output from said first adding means, and  
15 outputting the result of the division as the black  
correction reference data after the correction.

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18. The image reading device as claimed in  
claim 12, wherein said correcting means comprises:

first adding means for calculating a sum of  
false output levels of empty transfer part from said  
25 empty transfer part output generating means for

predetermined pixels obtained when the black correction reference data is detected;

second adding means for calculating a sum of false output levels of empty transfer part from said  
5 empty transfer part output generating means for the predetermined pixels obtained when the image is read;

a microcomputer multiplying the sum output from said second adding means with the black correction reference data; and

10                 dividing the result of the multiplication by the sum output from said first adding means, and outputting the result of the division as the black correction reference data after the correction.

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19. An image forming apparatus comprising:  
the image reading device claimed in claim 11;  
20 and

image forming means for forming an image on a sheet based on the image data read by said image reading device.

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20. An image forming apparatus comprising:  
the image reading device claimed in claim 12;  
and  
image forming means for forming an image on a  
5 sheet based on the image data read by said image reading  
device.